Features

- Integrated Diplexer Transceiver
- 2x10 SFF pinout supports I^2C digital diagnostics
- Voice/Data FTTx ONT/ONU Applications
- 1244 Mbps Tx, 2488 Mbps Rx Asymmetric Data Rate
- 1310 nm Tx, 1490 nm Rx
- TX Burst Mode Detection , TX_SD
- RX Sqelch
- Burst Mode TX DDM
- Digital diagnostic interface compliant with SFF-8472
- 28 dB link budget; Class B+; 20 km reach
- Compliant to FSAN G.984.5 Specifications
- Commercial or Industrial temperature operating range
- Compliant to IEC-60825 Class 1 laser diode
- RoHS compliant

Regulatory Compliance

Table 1 – Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>500V for XFI pins, >2000V for other pins.)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Immunity	IEC 61000-4-3	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class I laser product.
RoHS	2011/65/EU	Compliant with standards

Absolute Maximum Ratings

Table 2 – Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T_S	-40	-	+85	°C	
Supply Voltage	V_{CC}_Rx	-0.4	-	+4.2	V	
	V_{CC}_Tx	-0.4	-	V_{CC}_Rx+1	V	
Operating Relative Humidity	RH	5	-	95	%	
Soldering Temperature/Time	-	-	-	260/10	°C/s	

Recommended Operating Conditions

Table 3 – Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature (SFS-34-24T-HP-CDFB)	T_C	0	-	70	°C	
Operating Case Temperature (SFS-34-24T-HP-TDFB)	T_C	-40	-	85	°C	
Operating Voltage	V_{CC}	3.14	3.30	3.46	V	
Total TX and RX Supply Current	I_{CC}	-	-	350	mA	
Power Dissipation	P_D	-	-	1.3	W	
Bit Rate(Tx)	BR	-	1244.16	-	Mbps	
Bit Rate(Rx)	BR	-	2488.32	-	Mbps	
Transmission Distance	TD	-	-	20,000	m	

Optical Characteristics

Table 4 – Optical Characteristics

Transmitter						
Parameter	**Symbol**	**Min.**	**Typical**	**Max.**	**Unit**	**Notes**
Center Wavelength Range	λ_C	1290	1310	1330	nm	
Average Launch Power, Po	P_{OUT}	0.5	-	5	dBm	
Average Output Power (Laser Off)	$P_{0UT-OFF}$	-	-	-45	dBm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Spectral Width (-20dB)	λ_{20}	-	-	1	nm	
Extinction Ratio	ER	10	-	-	dB	1
Jitter Generation	JG	-	-	0.2	UI	2

Transmitter Output Eye	Compliant with G.984.2 Figure 3					
Receiver						
Center Wavelength Range	λ_C	1480	1490	1500	nm	
Received Optical Power	P_{in}	-27	-	-8	dBm	3
Signal Detect Assertion Level	SDA	-	-	-28	dBm	
Signal Detect De-Assertion Level	SDD	-45	-	-	dBm	
Hysteresis	$P_{SDA-SDD}$	0.5	-	6	dB	
1310nm Tx to 1490nm Rx Crosstalk		-	-	-47	dB	
1555nm Rx to 1490nm Isolation		30	-	-	dB	
Optical Return Loss		20	-	-	dB	
G.984.5 Wavelength Blocking Filter Isolation		22 7 7 22	-	-	dB, 1441 nm dB, 1450 nm dB, 1530 nm dB, 1539 nm	

Notes:

1. Measured with a PRBS 2^{23}-1, NRZ, 50% duty cycle.
2. 4kHz to 10MHz
3. Measured with a PRBS 2^{31}-1, 50% duty cycle.

Electrical Characteristics

Table 5 – Electrical Characteristics

Transmitter						
Parameter	**Symbol**	**Min.**	**Typical**	**Max.**	**Unit**	**Notes**
Differential Data Input Voltage	$V_{IN,P-P}$	400	-	1600	mVpp	4
Input Differential Impedance	Z_{IN}	-	100	-	Ω	
Optical Rise and Fall Time (20%-80%)	T_R/T_F	-	-	250	ps	
Tx Burst Enable Time	T_{BURST_EN}	-	-	12.86	ns	
Tx Burst Disable Time	T_{BURST_DIS}	-	-	12.86	ns	
Transmitter Burst Control Voltage - Low	$V_{burst,\ L}$	0		0.8	V	
Transmitter Burst Control Voltage - High	$V_{burst,\ H}$	2.0		3.3	V	
Receiver						
Differential Output Voltage		400	-	1600	mV	5
Signal Detect Output HIGH Voltage	V_{SD_High}	2.4	-	3.3	V	6
Signal Detect Output LOW Voltage	V_{SD_Low}	0	-	0.4	V	7
TX_SD timing “D”	Ttx_sd-d	-	-	1000	ns	8
TX_SD timing “X”	Ttx-sd_x	-	-	350	ns	8
TX_SD Startup Time	Ttx_sd-startup	-	-	300	ms	8

Notes:

4. TXD+/-. DC-coupled.
5. CML output, AC coupled(0.1μF)
6. LVTTL with internal 1kΩ pull up resistor. Asserts HIGH when input data amplitude is above threshold.
7. LVTTL. De-asserts LOW when input data amplitude is below threshold.
8. TX_SD Timing diagram and TX_SD Startup timing diagram are as follows:

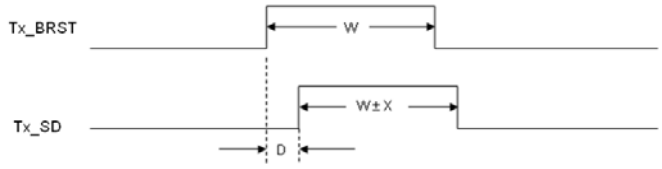

Figure 1, TX_SD Timing diagram

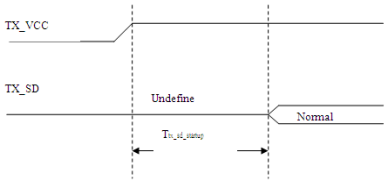

Figure 2, TX_SD Startup Timing diagram

Mechanical Diagram

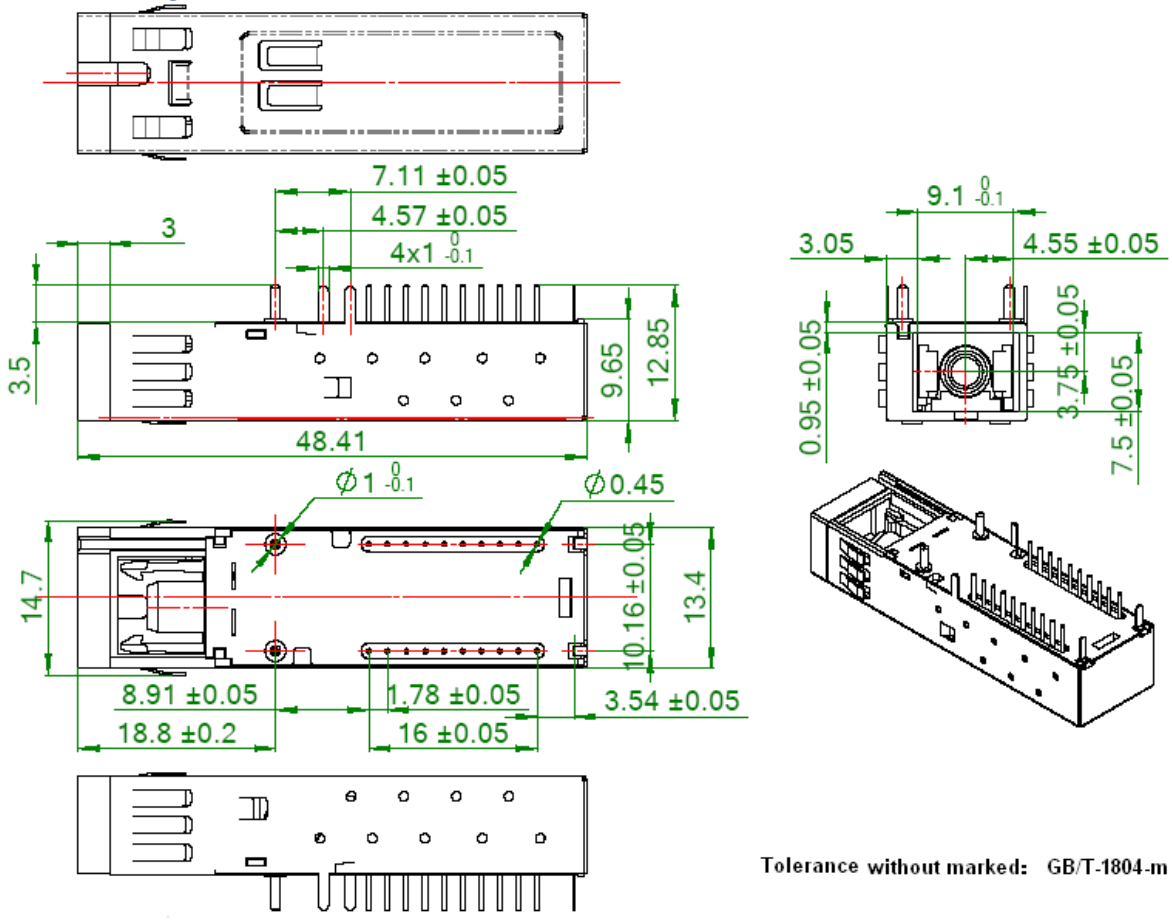

Figure 3, Mechanical Diagram

Label Information

Following is the label template for SFS-34-24T-HP-CDFB and SFS-34-24T-HP-TDFB.

Figure 4，product label template

Recommended Interface Circuit

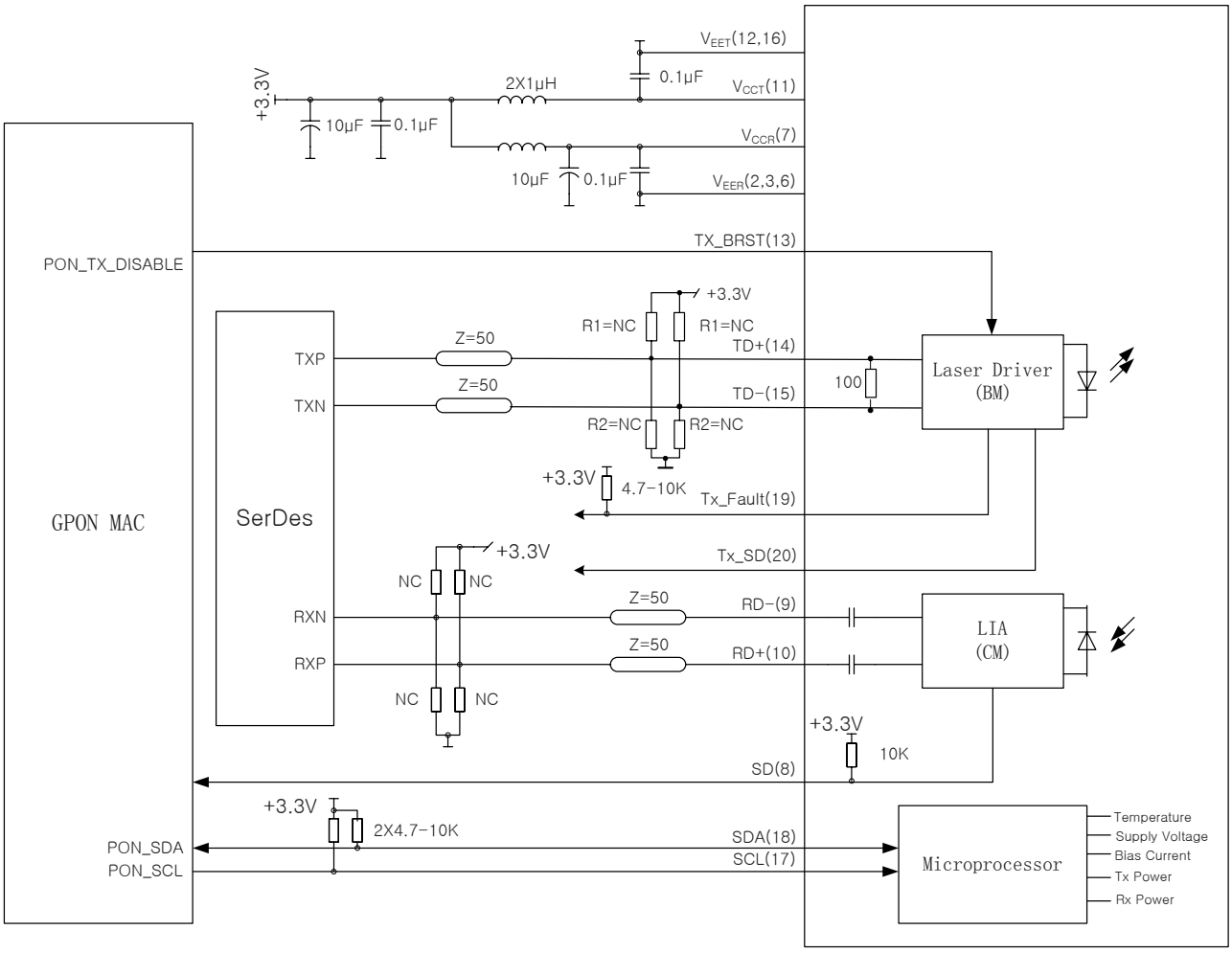

Figure 5, Recommended Interface Circuit

Pin Definitions

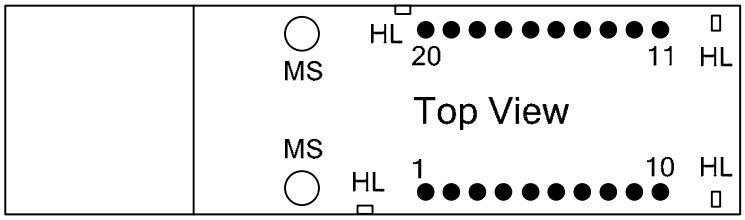

Figure 6, Pin Assignment

Table 6 – Pin definitions

Pin	Logic	Symbol	Name/Description	Note
1	NA	NC	No User Connection	
2	NA	GND_RX	Digital Rx Ground	
3	NA	GND_RX	Digital Rx Ground	
4	NA	NC	Reserved. No User Connection	
5	NA	NC	Reserved. No User Connection	
6	NA	GND_RX	Digital Rx Ground	
7	NA	V_{CC}_RX	Digital Rx Vcc	
8	LVTTL-O	SD	Signal Detect output, pull up internally. Asserts high when input optical power level is above threshold	
9	CML-O	RxD-	RX data bar output, CML. 50Ω terminated to Vcc and AC coupled to module output (0.1μF)	
10	CML-O	RxD+	RX data output, CML. 50Ω terminated to Vcc and AC coupled to module output (0.1μF)	
11	NA	V_{CC}_TX	Digital TX Vcc	
12	NA	GND_TX	Digital TX Ground	
13	LVTTL-I	TX_BRST	TX Burst Enable, LVTTL Input, Active Hign.	
14	CML-I	TxD+	TX data input, CML. Internally DC coupled.	
15	CML-I	TxD-	TX data bar input, CML. Internally DC coupled.	
16	NA	GND_TX	Digital TX Ground	
17	LVTTL-I	SCL	Clock Line of the I^2C interface	1
18	LVTTL-I/O	SDA	Data Line of the I^2C interface	1
19	LVTTL-O	TX Fault	TX Fault Alarm, LVTTL Output, TX Fault State: High; TX Normal State: Low	
20	LVTTL-O	TX_SD	TX Signal Detect	

Note

1. This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10K ohms to a Host_Vcc on the host board.

EEPROM Information

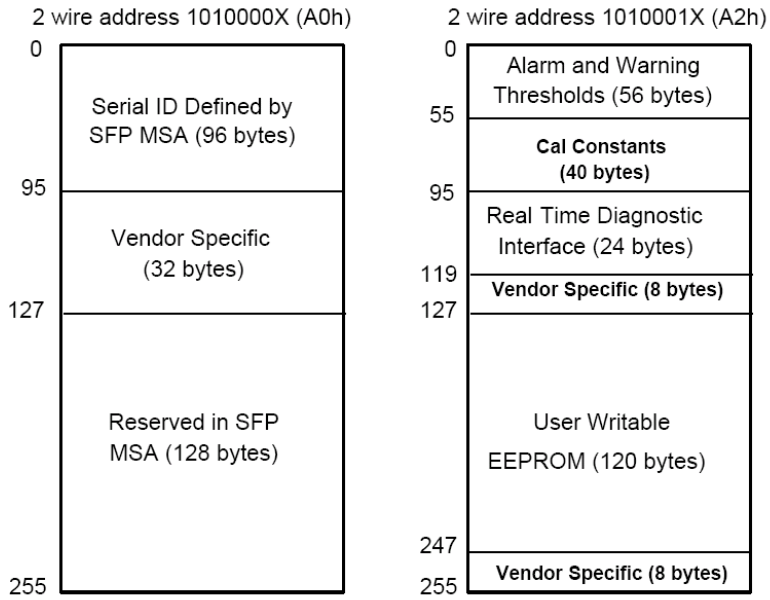

Figure 7, EEPROM Diagram

Table 7 –EEPROM Memory Content (A0h)

Addr.	Field Size (Bytes)	Name of Field	Hex	Description
0	1	Identifier	02	SFF transceiver
1	1	Ext. Identifier	04	MOD4
2	1	Connector	01	SC
3-10	8	Transceiver	00 00 00 00 00 00 00 00	
11	1	Encoding	03	NRZ
12	1	BR, Nominal	0C	1.244Gbps
13	1	Reserved	00	
14	1	Length (9um)-km	14	20(km)
15	1	Length (9um)	C8	200(100m)
16	1	Length (50um)	00	Not Support MMF
17	1	Length (62.5um)	00	Not Support MMF
18	1	Length (Copper)	00	Not Support Copper
19	1	Reserved	00	
20-35	16	Vendor name	53 4F 55 52 43 45 50 48 4F 54 4F 4E 49 43 53 20	“SOURCEPHOTONICS ”(ASCⅡ)
36	1	Reserved	00	
37-39	3	Vendor OUI	00 00 00	
40-55	16	Vendor PN	53 46 53 33 34 32 34 54 48 50 43(54) 44 46 42 20 20	“SFS3424THPC(T)DFB” (ASCII) C-temp part number
56-59	4	Vendor Rev	31 30 20 20	ASCII(“31 30 20 20” means 1.0 Revision)
60-61	2	Wavelength	05 1E	1310nm Laser Wavelength
62	1	Reserved	00	

63	1	CC_BASE	xx	Check sum of byte 0-62
64-65	2	Options	00 0C	Rx_SD, Tx_Fault
66	1	BR, max	00	
67	1	BR, min	00	
68-83	16	Vendor SN	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	ASCII
84-91	8	Date code	xx xx xx xx xx xx 20 20	Year(2 bytes),Month(2 bytes), Day(2 bytes)
92	1	Diagnostic Monitoring Type	68	Compliant with SFF-8472 Internally Calibrated Received power measurement type -Average Power
93	1	Enhanced Options	B0	Diagnostics (Optional Alarm/warning flags). Soft TX_FAULT monitoring implemented. Soft RX_SD monitoring implemented.
94	1	SFF-8472 Compliance	02	Diagnostics Compliance(SFF-8472 V9.5)
95	1	CC_EXT	xx	Check sum of byte 64-94
96-255	64	Vendor Specific		

Table 8 –EEPROM Memory Content (A2h)

Addr.		Field Size (Bytes)	Name of Field	Hex	Description
0	00	2	Temp High Alarm	64 00(I temp) 50 00(C temp)	100℃（I temp） 80℃（C temp）
2	02	2	Temp Low Alarm	CE 00(I temp) F3 00(C temp)	-50℃（I temp） -13℃（C temp）
4	04	2	Temp High Warning	5A 00 (I temp) 4B 00(C temp)	90℃（I temp） 75℃（C temp）
6	06	2	Temp Low Warning	D8 00(I temp) F8 00(C temp)	-40℃（I temp） -8℃（C temp）
8	08	2	Voltage High Alarm	8C A0	3.6V
10	0A	2	Voltage Low Alarm	75 30	3.0V
12	0C	2	Voltage High Warning	88 B8	3.5V
14	0E	2	Voltage Low Warning	79 18	3.1V
16	10	2	Bias High Alarm	AF C8	90mA
18	12	2	Bias Low Alarm	00 00	0mA
20	14	2	Bias High Warning	88 B8	70mA
22	16	2	Bias Low Warning	00 00	0mA
24	18	2	TX Power High Alarm	9B 82	6dBm
26	1A	2	TX Power Low Alarm	22 D0	-0.5dBm
28	1C	2	TX Power High Warning	7B 86	5dBm
30	1E	2	TX Power Low Warning	2B D4	0.5dBm

32	20	2	RX Power High Alarm	07 CB	-7dBm
34	22	2	RX Power Low Alarm	00 0F	-28dBm
36	24	2	RX Power High Warning	06 30	-8dBm
38	26	2	RX Power Low Warning	00 14	-27dBm
40	28	16	Reserved	00….000	Reserved
56	38	4	RX_PWR(4) Calibration	00 00 00 00	4th order RSSI calibration coefficient
60	3C	4	RX_PWR(3) Calibration	00 00 00 00	3rd order RSSI calibration coefficient
64	40	4	RX_PWR(2) Calibration	00 00 00 00	2nd order RSSI calibration coefficient
68	44	4	RX_PWR(1) Calibration	3F 80 00 00	1st order RSSI calibration coefficient
72	48	4	RX_PWR(0) Calibration	00 00 00 00	0th order RSSI calibration coefficient
76	4C	2	TX_I(Slope) Calibration	01 00	Slope for Bias calibration
78	4E	2	TX_I(Offset) Calibration	00 00	Offset for Bias calibration
80	50	2	TX_PWR(Slope) Calibration	01 00	Slope for TX Power calibration
82	52	2	TX_PWR(Offset) Calibration	00 00	Offset for TX Power calibration
84	54	2	T(Slope) Calibration	01 00	Slope for Temperature calibration
86	56	2	T(Offset) Calibration	00 00	Offset for Temperature calibration, in units of 256ths C
88	58	2	V(Slope) Calibration	01 00	Slope for VCC calibration
90	5A	2	V(Offset) Calibration	00 00	Offset for VCC calibration
92	5C	3	Reserved	00 00 00	Reserved
95	5F	1	Checksum	xx	Checksum
96	60	2	Transceiver Temperature	xx xx	Temperature in C/256
98	62	2	Supply Voltage	xx xx	Vcc
100	64	2	TX Bias Current	xx xx	BIASMON
102	66	2	TX Optical Output Power	xx xx	Back facet monitor
104	68	2	RX Optical Input Power	xx xx	RSSI
106	6A	2	Reserved	00 00	Reserved
108	6C	2	Reserved	00 00	Reserved
110	6E.7	1bit	TX_DIS State	x	Soft TX disable state
	6E.6	1bit	Soft TX Disable	x	Write bit that allows software disable laser output.
	6E.5	1bit	Reserved.	0	Reserved
	6E.4	1bit	Rate Select State	0	NOT SUPPORTED.
	6E.3	1bit	Rate Select	0	NOT SUPPORTED.
	6E.2	1bit	TX_FAULT	x	Digital state of the TX Fault Output
	6E.1	1bit	Rx LOS	x	Digital state of the Rx LOS Output
	6E.0	1bit	Data Ready Bar	x	Indicates transceiver has achieved power up and data is ready.
111	6F.7	1bit	Reserved	0	Reserved
	6F.6	1bit	Reserved	0	Reserved
	6F.5	1bit	Reserved	0	Reserved
	6F.4	1bit	Reserved	0	Reserved

	6F.3	1bit	Reserved	0	Reserved
	6F.2	1bit	Reserved	x	Reserved
	6F.1	1bit	Reserved	0	Reserved
	6F.0	1bit	Reserved	x	Reserved
112	70.7	1bit	Temperature too high alarm	x	Temperature too high alarm
	70.6	1bit	Temperature too low alarm	x	Temperature too low alarm
	70.5	1bit	VCC too high alarm	x	VCC too high alarm
	70.4	1bit	VCC too low alarm	x	VCC too low alarm
	70.3	1bit	BIASMON too high alarm	x	BIASMON too high alarm
	70.2	1bit	BIASMON too low alarm	x	BIASMON too low alarm
	70.1	1bit	TX Power too high alarm	x	TX Power too high alarm
	70.0	1bit	TX Power too low alarm	x	TX Power too low alarm
113	71.7	1bit	RX Power too high alarm	x	RX Power too high alarm
	71.6	1bit	RX Power too low alarm	x	RX Power too low alarm
	71.5	1bit	Reserved interrupt status bit	x	Reserved interrupt status bit
	71.4	1bit	Reserved interrupt status bit	x	Reserved interrupt status bit
	71.3	1bit	Reserved interrupt status bit	x	Reserved interrupt status bit
	71.2	1bit	Reserved interrupt status bit	x	Reserved interrupt status bit
	71.1	1bit	Reserved interrupt status bit	x	Reserved interrupt status bit
	71.0	1bit	Reserved interrupt status bit	x	Reserved interrupt status bit
114	72	1	Reserved	00	Reserved
115	73	1	Reserved	00	Reserved
116	74.7	1bit	Temperature too high warning	x	Temperature too high warning
	74.6	1bit	Temperature too low warning	x	Temperature too low warning
	74.5	1bit	VCC too high warning	x	VCC too high warning
	74.4	1bit	VCC too low warning	x	VCC too low warning
	74.3	1bit	BIASMON too high warning	x	BIASMON too high warning
	74.2	1bit	BIASMON too low warning	x	BIASMON too low warning
	74.1	1bit	TX Power too high warning	x	TX Power too high warning
	74.0	1bit	TX Power too low warning	x	TX Power too low warning
117	75.7	1bit	RX Power too high warning	x	RX Power too high warning
	75.6	1bit	RX Power too low warning	x	RX Power too low warning
	75.5	1bit	Reserved interrupt status bit	0	Reserved interrupt status bit
	75.4	1bit	Reserved interrupt status bit	0	Reserved interrupt status bit
	75.3	1bit	Reserved interrupt status bit	0	Reserved interrupt status bit
	75.2	1bit	Reserved interrupt status bit	0	Reserved interrupt status bit
	75.1	1bit	Reserved interrupt status bit	0	Reserved interrupt status bit
	75.0	1bit	Reserved interrupt status bit	0	Reserved interrupt status bit
118	76	1	Reserved	00	Reserved
119	77	1	Reserved	00	Reserved
120	78	8	Vendor Specific	00 00 00 00 00 00 00 00	Vendor Specific

Table 9 – Digital Diagnostic Specification (A2h)

Data Address	Parameter	Range	Accuracy
96-97	Temperature	-5 to 85°C (C-temp) -40 to 85°C (I-temp)	±3°C
98-99	Vcc Voltage	3.0V to 3.6V	±3%
100-101	Bias Current	0 to 100mA	±10%
102-103	TX Power	0.5 to 5dBm	+/-2dB
104-105	RX Power	-28 to -8dBm	+/-3dB

Note: Only for continuous mode

Order Information

Table 10 – Order Information

Part No.	Application	Data Rate	Laser Source Fiber Type	Temp Range
SFS-34-24T-HP-CDFB	GPON ONT	TX:1244.16Mb/s RX:2488.32Mb/s	1310nm DFB SMF	0 to 70°C
SFS-34-24T-HP-TDFB	GPON ONT	TX:1244.16Mb/s RX:2488.32Mb/s	1310nm DFB SMF	-40 to 85°C

Warnings

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.
Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

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